An ATTEMPT FOR THE EXPLICATION Of the PHÆNOMENA, Obſervable in an Experiment Publiſhed by the Honourable ROBERT BOYLE, Eſq;

In the XXXV. Experiment of his Epiſtolical Diſcourſe touching the *AIRE*.

In Confirmation of a former Conjecture made by *R. H.*

Nos cum non ſemper magna referre poſſimus, vera tamen ſed rara recitamus; neq; enim minori miraculo in parvis Natura ludit quam in magnis, Cardan *de* Vari. *L.* 8. *Cap.* 43.

Tum vero de Scientiarum progreſſu ſpes bene fundabitur, quum in hiſtoriam naturalem recipientur & aggregabuntur complura experimenta, quæ in ſe nullius ſunt uſus, ſed ad inventionem cauſarum & axiomatum tantum faciunt, Verulamii Nov. Org. Aph. 99.

LONDON,
Printed by *F. H.* for *Sam. Thomſon* at the Biſhops Head in St. *Pauls* Church-yard, 1661.

To the Honourable *Robert Boyle*, Esq;

Sir,

THe honour you were pleased to do me, in putting me upon this enquiry, did not a little animate and encourage me to persevere in what I had begun with so happy an Omen. My good Success therefore herein, if any, is wholly to be ascribed to your self; as being the first Excitor and chief Abettor of it. And therefore I hope that may be my excuse, for craving You so great a Patron thereunto, in that I could not have entitled it to any other without a manifest Injury to Your Honour; whose Graci-

ous countenancing of it, juſtly requires my utmoſt Gratitude. I muſt therefore with the *Perſian* offer to you, as he to the Sun, what he believes himſelf to have received from it. And therefore I truſt my endeavouring to ſoar aloft with the Eagle, to enjoy the Influence of the moſt Glorious Light of the world, will find a Pardon, and be judged much better, than a hovering and fluttering with the ſilly Fly about the dim and fading Flame of a candle, that at beſt, will but ſinge thoſe wings that raiſed it ſo high, and in ſtead of giving it more Vigour, will wholly diſinable it for the like Future Attempts. I am not a little ſenſible indeed, that the Minuteneſs both of the thing and its Author, may ſeem to make it a Preſent very unfit

unfit for ſo great a Perſonage. But yet I am in hope, that like the poor man, that ſeeing many Noble and Rich, haſting to meet *Artaxerxes*, with their Splendid and Sumptuous Gifts, would needs carry ſomthing too, and though 'twas but a little water fetch'd out of the River in the Palms of his Hands, yet addreſſing himſelf, he preſented it with an unexpected acceptance, I alſo may be happy in the like ſucceſs, with this Oblation, which is but a few drops taken out of the River (as I may ſo ſpeak) of the *Phænomena* of Nature (which paſſes by, and is ſcarce regarded by any, though free for all) *that is*, ſome few obſervations, which though but mean and obvious, yet I think ſcarce diligently taken notice of by any; and though

jumbled together in a careleſs, if any Method, yet the beſt I had leiſure to throw it into. And though delivered in a Style nothing elegant, yet I hope (which was my greateſt aim) it may ſerve (with your favourable conſtruction of it) to ſignifie the deſire I have of expreſſing my ſelf moſt affectionately to be

Sir,

Your Honours moſt Faithful

and moſt Humble Servant,

Robert Hooke.

The

The Experiment, as I find it ſet down in the fore-mentioned Epiſtle, runs thus;

AN Eminent Mathematician told me one day, that ſome inquiſitive Frenchmen (whoſe Names I know not) had obſerved, that in caſe one end of a ſlender and perforated Pipe of Glaſs, as A. B. or C. *be dipt in water,* as in that conteined in the Veſſel, G. H. of the 8th. Figure, *the Liquor will aſcend to ſome height in the Pipe,* as to D. E. or F. *though held perpendicular to the plain of the water. And to ſatisfie me, that he miſ-related not the Experiment, he ſoon after brought two or three ſmall Pipes of Glaſs, which gave me the opportunity of trying it, though I had the leſs reaſon to diſtruſt it, becauſe I remember I had often in the long and ſlender Pipes of ſome Weather-*

Glaſſes, which I had cauſed to be made after a ſomwhat peculiar faſhion; taken notice of the like aſcenſion of the Liquor, though (preſuming it might be caſual) I had made but little reflection upon it. But after this trial, beginning to ſuppoſe, that though the water in theſe Pipes that were brought me, riſe not above a quarter of an Inch (if near ſo high) yet, if the Pipes were made ſlender enough, the water might riſe to a very much greater height; I caus'd ſeveral of them to be, by a dexterous hand, drawn out at the flame of a Lamp, in one of which that was almoſt incredibly ſlender, we found that the water aſcended (as it were of it ſelf) five Inches by meaſure, to the no ſmall wonder of ſome famous Mathematicians, who were Spectators of ſome of theſe Experiments And this height the Water reached to, though the Pipe were held in as erected a poſture as we could: For if it were inclined, the water would fill a greater part of it, though not riſe higher in it And we alſo found, that when the inſide of the Pipe was wetted beforehand, the water would riſe much better than otherwiſe: but we cauſed not all our ſlender Pipes to be made ſtraight, but ſome of them crooked, like Syphons: And having immerſed the

the ſhorter Leg of one of theſe into a Glaſs that held ſome fair water, we found as we expected, that the water ariſing to the top of the Syphon, though that were high enough, did of it ſelf run down the longer Leg, and continue running like an ordinary Syphon. The cauſe of this aſcenſion of the water, appeared to all that were preſent, ſo difficult, that I muſt not ſtay to enumerate the various Conjectures that were made at it, much leſs to examine them; eſpecially having nothing but bare Conjectures to ſubſtitute in the room of thoſe I do not approve. We tried indeed, by conveying a very ſlender Pipe and a ſmall Veſſel of water into our Engine, whether or no the Exſuction of the ambient Air would aſſiſt us to find the cauſe of the aſcenſion we have been ſpeaking of: But though we employed red Wine in ſtead of water, yet we could ſcarce certainly perceive through ſo much Glaſs, as was interpoſed betwixt our eyes and the Liquor, what happened in a Pipe ſo ſlender, that the redneſs of the Wine was ſcarce ſenſible in it. But as far as we could diſcern, there happened no great alteration to the Liquor: which ſeemed the leſs ſtrange, becauſe the Spring of that Air that might depreſs the

water

water in the Pipe, was equally debilitated with that which remained to preſs upon the Surface of the Water in the little Glaſſe. Wherefore, in favour of his ingenuous Conjecture, who aſcribed the Phænomenon, *under conſideration to the greater preſſure made upon the water by the Air without the Pipe, than by that within it, (where ſo much of the water (conſiſting perhaps of Corpuſcles more pliant to the internal ſurfaces of the glaſs) was contiguous to the ſides) it was ſhown, that in caſe the little Glaſs-Veſſel that held the water, of which a part aſcended into the ſlender Pipe, were ſo cloſed, that a man might with his mouth ſuck the Air out of it, the water would immediatly ſubſide in the ſmall Pipe. And this would indeed infer, that it aſcended before only by the preſſure of the incumbent Air. But that it may (how juſtly I know not) be objected, that peradventure this would not happen, in caſe the upper end of the Pipe were in a* vacuum: *And that 'tis very probable the water may ſubſide, not becauſe the preſſure of the internal Air is taken off by exſuction, but by reaſon of the ſpring of the external Air, which impels the water it finds in its way to the Cavity deſerted by the other*

Air,

Air, and would as well impel the ſame water upwards, as make it ſubſide, if it were not for the accidental poſture of the Glaſſes. However, having not now leiſure to examine any further this Matter, I ſhall only mind your Lordſhip, that if You will proſecute this Speculation, it will be pertinent to find out likewiſe, Why the ſurface of Water (as is manifeſt in Pipes) uſes to be concave, being depreſſed in the middle, and higher on every ſide? and why in Quick-ſilver on the contrary, not only the ſurface is wont to be very convex, or ſwelling, in the middle; but if you dip the end of a ſlender Pipe in it, the ſurface of the Liquor (as 'tis called) will be lower within the Pipe, than without. Which Phænomena, *whither, and how far, they may be deduced from the Figure of the Mercurial Corpuſcles, and the Shape of the Springy Particles of the Air, I willingly leave to be conſidered.*

An

An Attempt for the Explication of this New Experiment.

MY former Conjecture, *That the unequal height of the ſurfaces of the water proceeded from the greater preſſure made upon the water by the Air without the Pipes* A. B. C. *than by that within them*; I ſhall endeavour to confirm from the Truth of the two following Propoſitions.

The firſt of which is, That an unequal preſſure of the incumbent Air, will cauſe an unequal height in the waters Surfaces.

And the Second is, That in this Experiment there is ſuch an unequal preſſure.

Now that the Firſt is true, the following Experiment will evince: For if you

you take any Veſſel ſo contrived, as that you can at pleaſure either increaſe or diminiſh the preſſure of the Air upon this or that part of the Superficies of the water, the equality of the height of thoſe parts will preſently be loſt. And that part of the Superficies that ſuſtains the greater preſſure, will be inferiour to that which undergoes the leſs: A fit Veſſel for this purpoſe, will be an inverted Glaſs *Syphon*, ſuch an one as is deſcribed in the Sixth Figure. For if into it you put a quantity of Water, ſuppoſe enough to fill it as high as the Line *A B*. and applying your mouth to one end, as to *D*. you ſhall find, that by gently blowing in at it, you ſhall depreſs the Superficies *B*. and thereby raiſe the oppoſite Superficies *A*. to a conſiderable diſtance; and by gently ſucking, you may perceive the clean contrary effects produced.

Next, That there is ſuch an unequal preſſure, I ſhall prove from this, that there is a much greater inconformity or incongruity (call it what you pleaſe) of Air to Glaſs, and ſome other Bodies, than there is of Water to the ſame.

What I mean hereby, I ſhall in ſhort explain,

explain, by defining conformity or congruity to be a property of a fluid Body, whereby any part of it is readily united or intermingled with any other part, either of it self, or of any other Homogeneal or Similar, fluid, or firm and solid body: And unconformity or incongruity to be a property of a fluid, by which it is kept off and hindred from uniting or mingling with any heterogeneous or dissimilar, fluid or solid Body.

This last property, any one that hath been observingly conversant about fluid Bodies, cannot be ignorant of: For (not now to mention several Chimical Spirits and Oyles which will very hardly, if at all, be brought to mix with one another, insomuch that there may be found some 8 or 9, or more, several distinct Liquors, which swimming one upon another, will not be brought to mix) we need seek no further for Examples of this kind, than to observe the drops of rain falling through the air; and the Bubbles of air which are by any means conveyed under the surface of the Water; or a drop of common Sallet Oyl swimming upon water: In all which, and many more Examples that might be enumerated, of

this

this ſort, the incongruity of two fluids is eaſily diſcernable. And as for examples of Congruity or Incongruity of Liquids one with another, or with ſeveral kinds of firm, or ſolid Bodies, they have long ſince been taken notice of, and called by the Names of Drineſs and Moyſture, (though theſe two Names are not comprehenſive enough, they being commonly uſed to ſignifie only the adhering or not adhering of water to ſome other ſolid Bodies) of this kind we may obſerve that water will more readily wet ſome woods than others; and that water let fall upon a Feather, the whiter ſide of a Colwort, and ſome other leaves, or upon almoſt any unctuous or reſinous ſuperficies, *&c.* will not at all adhere to them, but eaſily tumble off from them, like a ſolid Bowl; whereas if drop upon Linnen, Paper, Clay, green Wood, *&c.* it will not be taken off, without leaving ſome part of it behind adhering to them: So Quickſilver, which will very hardly be brought to ſtick to any vegetable body, will readily adhere to, and mingle with ſeveral clean metalline bodies.

Now from what cauſe this congruity

or

or Incongruity of bodies one to another, does proceed, whether from the Figure of their conſtituent Particles, or interſperſed pores, or from the differing motions of the parts of the one and the other, as whether circular, undulating, progreſſive, *&c.* whether I ſay from one, or more, or none of theſe enumerated cauſes, I ſhall not here determine; It being an enquiry more proper to be followed and explained among the general Principles of Philoſophy, whither at preſent I ſhall refer it; as fearing leſt it might here ſeem abſurd, without the concatenation of ſeveral other Principles to explicate it; and knowing it likewiſe ſufficient for this enquiry to ſhew, that there is ſuch a property, from what cauſe ſoever it proceeds.

Theſe Properties therefore (alwaies the concomitants of fluid bodies) produce theſe following viſible Effects:

Firſt, They unite the parts of a fluid to its homogeneal Solid, or keep them ſeparate from its heterogeneal: Hence Quickſilver will (as we noted before) ſtick to Gold, Silver, Tin, Lead, *&c.* and unite with them: but roule off from wood, ſtone, glaſs, if never ſo little ſcituated

out

out of its horizontale Paraleliſme; and water that will wet ſalt and diſſolve it, will ſlip off from Tallow, or the like, without at all adhering; as it may likewiſe be obſerved to do, upon a duſty ſuperficies. And next they cauſe the parts of homogeneal fluid bodies readily to adhere together and mix, and of heterogeneal, to be exceeding averſe thereunto. Hence we find, that two ſmall drops of water, on any ſuperficies they can roule on, will, if they chance to touch each other, readily unite and mix in one 3d. Globule or drop: the like may be obſerved with two ſmall Bowls of Quickſilver upon a Table or Glaſs, provided the ſurfaces of thoſe Globule be not duſty; and with two drops of Oyl upon fair water, *&c.* And further, water put unto wine, ſalt water, Vinegar, ſpirit of wine, or the like, does immediatly (eſpecially if they be ſhaken together) diſperſe it ſelf all over them: hence on the contrary alſo we find, that water powred upon Quickſilver, and Oyl upon that water, and Air upon that Oyl, though they be ſtopt cloſely up into a Bottle, and ſhaken never ſo much, they will by no means long ſuffer any of their

bigger parts to be united or included within any of the other Liquors (by which recited Liquors, may be plainly enough represented the 4 Peripaterical Elements.) From this property 'tis that a drop of water does not mingle with, or vanish into Air, but is driven (by that fluid equality protruding it on every side) and forc't into as little a space as it can possibly be contained in, namely, into a Round Globule. So likewise a little air blown under the water, is united or thrust into a Bubble, by the ambient water. And a parcel of Quicksilver enclosed with Air, water, or almost any other liquor, is formed into a round Ball.

Now the cause why all these included fluids newly mentioned, or as many others as are wholly included within a heterogeneous fluid, are not exactly of a spherical Figure (seeing that if caused by these Principles only, it could be of no other) must proceed from some other kind of pressure against the two opposite flatted sides. This adventitious or accidental pressure may proceed from divers causes, and accordingly must diversifie the Figure of the included heterogeneous

geneous fluid; For seeing that a body may be included either with a fluid only, or only with a solid, or partly with a fluid and partly with a solid, or partly with one fluid, and partly with another, there will be found a very great variety of the terminating surfaces, much differing from a Spherical, according to the various resistance or pressure that belongs to each of these encompassing mediums.

Which Properties may in general be deduced from two heads, *viz.* Motion, and Rest. For either this Globular Figure is altered by a natural Motion, such as is Gravity, or a violent, such as is any accidental motion of the fluids, as we see in the wind rusling up the water, and the purlings of Streams, and foaming of Cartaracts, and the like, which because they are so obvious and easily understood, and so little pertinent to our present enquiry, I shall refer to some other intended Speculations, to which they do more properly belong. Or thirdly, By the Firmness and Stability of the ambient Solid. For if the including Solid be of an angular or any other irregular Form, the included fluid will

be near of the like, as a Pint Pot full of water, or a Bladder full of Air. And next, if the Including or included fluid have a greater gravity one than another, then will the globular Form be depreſt into an Eliptico-ſpherical: As if for example, we ſuppoſe the Circle *A. B. C. D.* in the firſt Figure, to repreſent a drop of water, Quick-ſilver or the like, included with the Air, or the like, which ſuppoſing there were no gravity at all in either of the fluids, or that the contained and containing were of the ſame weight, would be equally depreſt into an exactly ſpherical body (the ambient preſſing equally againſt every ſide of it) But ſuppoſing either a greater gravity in the included, by reaſon whereof the parts of it being preſt from *A.* towards *B.* and thereby the whole put into motion, and that motion being hindred by the reſiſtance of the ſubjacent parts of the ambient, the globular Figure, *A. D. B. C.* will be depreſt into the Eliptico-ſpherical, *E. G. F. H.* For the ſide *A.* is detruded to *E.* by the Gravity, and *B.* to *F.* by the reſiſtance of the ſubjacent medium: and therefore *C.* muſt neceſſarily be thruſt to *G.* and *D.* to *H.* Or elſe ſuppo-

ſuppoſing a greater gravity in the ambient, by whoſe more than ordinary preſſure againſt the under ſide of the included globul, *B.* will be forced to *F.* & by its reſiſtance of the motion upwards, the ſide *A.* will be depreſt to *E.* and therefore *C.* being thruſt to *G.* & *D.* to *H.* the globular Figure by this means alſo will be made an Eliptico-ſpherical. Next if a fluid be included partly with one, and partly with another fluid, it will be found to be ſhaped diverſly, according to the proportion of the gravity and incongruity of the 3 fluids one to another, as in the ſecond Figure, let the upper *M M M* be Air, the middle *L. M. N. O* be common Oyle, the lower O. O. O. be water, the Oyl will be form'd not into a ſpherical Figure, ſuch as is repreſented by the pricked Line, but into ſuch a Figure as L. M. N. O. whoſe ſide L. M. N. will be of a flatter Eliptical Figure, by reaſon of the great diſproportion between the Gravity of Oyle and Air, and the ſide L. O. M. of a rounder, becauſe of the ſmaller difference between the weight of Oyle and water. Laſtly, The globular Figure will be changed, if the ambient be

partly fluid and partly solid. And here the termination of the incompassed fluid towards the incompassing is shap'd according to the proportion of the congruity or incongruity of the fluids to the solids, and of the gravity and incongruity of the fluids one to another. As suppose the subjacent medium that hinders an included fluid's descent, be a solid, as let K. L. in the first Figure represent the smooth superficies of a Table, E. G. F. H. a parcel of running Mercury, the side G. F. H. will be more flatted, according to the proportion of the incongruity of the Mercury and Air to the Wood, and of the gravity of Mercury and Air one to another; The side G. E. H. will likewise be a little more depress by reason the subjacent parts are now at rest which were before in motion (I have not here time, nor is it much to my present purpose, to shew how much the Figure of the descending fluid may be altered from this Eliptico spherical Figure, by a very small resistance of the subjacent medium, for the advantage the under parts of the descendent may have as to the acceleration of their motions of descent, may be able to

draw

draw them out into the Form of the Figure X.] Or further in the 3d. Figure, let A. I. L. D. represent an including solid medium of a cylindrical shape (as suppose a small Glass Jar) Let F. G. E. M. represent a contain'd fluid, as water; this towards the bottom and sides, is figured according to the concavity of the Glass: But its upper Surface, which by reason of its gravity, (not considering at all the Air above it, and so neither the congruity or incongruity of either of them to the Glass) should be terminated by part of a Sphear whose diameter should be the same with that of the earth, which to our sense would appear a straight Line, as F. G E. Or which by reason of its having a greater congruity to Glasse than Air has, (not considering its Gravity) would be thrust into a concave Sphear, as C. H. B. whose diameter would be the same with that of the concavity of the Vessel. But by reason of its having a greater gravity than the Air, and having likewise a greater congruity to Glass, than the Air has; from hence I say it is terminated, by a concave Eliptico-spherical Figure, as C. K. B. For by its congruity it ea-

ſily conforms it ſelf, and adheres to the Glaſs, and conſtitutes as 'twere one containing body with it, and therefore ſhould thruſt the contained Air on that ſide it touches it, into a ſpherical Figure, as B. H. C. but the motion of Gravity depreſſing a little the Corners B. and C. reduces it into the aforeſaid Figure, C. K. B. Now that 'tis the greater congruity of one of the two contiguous fluids, than of the other, to the containing ſolid, that cauſes the ſeparating ſurfaces of the two liquids to be thus or thus figured: And that 'tis not becauſe this or that figurated ſurface is more proper, natural or peculiar to one of theſe fluid bodies, than to the other, will appear from this, that the ſame fluids will by being put into differing ſolids, change their ſurfaces for the ſame water, which in a Glaſs or wooden Veſſel will have a concave ſurface upwards, and will riſe higher in a ſmaller than greater Pipe, the ſame water, I ſay, in the ſame Pipes greas'd over or oyled, will produce quite contrary effects, for it will have a protuberant and convex ſurface upwards, and will not riſe ſo high in ſmall, as in bigger Pipes: Nay,

in

in the very ſame ſolid Veſſel, you may make the very ſame two contiguous Liquids to alter their Surfaces; for taking a ſmall Wine-Glaſs, or ſuch like Veſſel, and pouring water gently into it, you ſhall perceive the ſurface of the water all the way concave, till it riſe even with the top, when you ſhall find it (if you gently and carefully poure in more) to grow very protuberant and convex; the reaſon of which is plain, for that the ſolid ſides of the containing body are no longer extended, to which the water does more readily adhere, than the air; but it is henceforth to be included with air, which would reduce it into a hemiſphere, but by reaſon of its gravity, it is flatted into an Oval. Quickſilver alſo which to Glaſs is more incongruous than Air (and thereby being put into a Glaſs-Pipe, will not adhere to it, but by the more congruous air will be forced to have a very protuberant ſurface, and to riſe higher in a greater than a leſſer Pipe) this Quickſilver to clean Metal, eſpecially to Gold, Silver, Tin, Lead, *&c.* Iron excepted, is more congruous than Air, and will not only ſtick to it, but have a concave Surface like water,

and

and rise higher in a less, than in a greater Pipe.

In all these Examples, 'tis evident, that there is an extraordinary and adventitious force by which the globular Figure of the contain'd heterogeneous fluid is altered, neither can it be imagined, how it should otherwise be of any other Figure than Globular: For being by the heterogeneous fluid equally protruded every way, whatsoever part is protuberant, will be thereby depress't. From this cause it is that in its effects it does very much resemble a round Spring (such as a Hoop) I shall not here speak of the nature of Springs in general, as being more proper for another Discourse, but only take notice, that as in a round Spring there is required an additional pressure against two opposite sides, to reduce it into an Oval Form, or to force it in between the sides of a Hole whose Diameter is less than that of the Spring, there must be a considerable force or protrusion against the concave or inner side of the Spring, so to alter this spherical constitution of an included fluid body, there is required more pressure against opposite sides to

reduce

reduce it into an Oval, and to preſs it into an Hole leſs in Diameter than it ſelf, it requires a greater protruſion againſt all the other ſides. What degrees of force are requiſite to reduce them into longer and longer Ovals, or to preſs them into leſs and leſs holes, I have not yet experimentally calculated; but thus much by experiment I find in general, that there is alwaies required a greater preſſure to cloſe them into longer Ovals, or protrude them into ſmaller holes: the neceſſity and reaſon of this, were it requiſite, I could eaſily explain: but being not ſo neceſſary, and requiring more room and time than I have for it at preſent, I ſhall here omit it; and proceed to ſhew, that this may be preſently found true, if Experiment be made with a Round Spring (the way of which trials can ſcarce be miſt by any one, at all converſant in Experiments) And with the fluid bodies of Mercury, Air, *&c.* the way of trying, which will be ſomwhat more difficult; and therefore I ſhall in brief deſcribe it. He therefore that would try with Air, muſt firſt be provided of a Glaſs-Pipe, made of the ſhape of that in the fifth Figure, where-

of

of the ſide A. B. repreſents a ſtraight Tube of about 3 foot long (C. D.) repreſents an other part of it, which conſiſts of C. E. F. G. D. &c. ſeveral round Bubles ſo ordered, that there is left a paſſage out of each of them, into its next; of which paſſages, that between C. and E. is to be the biggeſt; (as for example, $\frac{1}{2}$ of an Inch in Diameter) that between E. and F. is to be leſs, (*viz.* $\frac{1}{8}$ of an Inch) that between F. and G. ($\frac{1}{11}$ of an Inch) that between G. and D. ($\frac{1}{12}$) that above D ($\frac{1}{24}$ or half a Line) there may be added as many more as the experimenter ſhall think fit, with paſſages or interjacent holes continually decreaſing by known quantities ſo far as his ſenſes are able to help him; I ſay ſo far, becauſe there may be made Pipes ſo ſmall that it will be impoſſible to perceive the perforation with ones naked eye, though by the help of a Microſcope, it may eaſily enough be perceived: Nay, I have made a Pipe perforated from end to end, ſo ſmall, that with your naked eye you would very hardly have ſeen the body of it, inſomuch that I have been able to knit it up into a knot without breaking, but this by the by.

To

To proceed then, for the trial of the Experiment, the Experimenter muſt place the Tube (A. B.) perpendicular, and fill the Bubble E. with the paſſage beneath it, full of water, but leave the bubble C. full of Air, and then gently pouring in water into the Pipe A. B. he muſt obſerve diligently how high the water will riſe in it before it protrude the Bubble of Air, (C.) through the narrow paſſage into E. and denote exactly the height of the Cylinder of water, then filling the bubble F. with water and E. with air, he may proceed as formerly, denoting likewiſe the height of the Cylinder of water, able to protrude the Bubble E. through the paſſage E. F. the like may he do with the next paſſage, and the next, *&c.* as far as he is able, then comparing the ſeveral heights of the Cylinders, with the ſeveral holes through which each Cylinder did force the air (having due regard to the Cylinders of water in the Tube C. D) it will be very eaſie to determine, what force is requiſite to preſs the Air into ſuch and ſuch a hole, or (to apply it to our preſent experiment) how much of the preſſure of the Air is taken off by its ingreſs into

ſmaller

ſmaller and ſmaller holes. Now becauſe to prepare this Inſtrument, is ſomthing difficult (by reaſon of the holes which will be found very troubleſom to be meaſured) it will be better to prepare ſmall Gla's-Pipes, ſuch as F. G. H. I. K. L. of the ſeveral Bores deſired, each of them about an Inch long, and having a Pipe, (ſuch as is deſcribed in the 5th. Figure) with only one Bubble, as (C) with the paſſage (C.E) and proceeding as before, to force the Air firſt through that; then to faſten into it with Cement the next ſmaller Pipe, and try with it as with the other; then a leſs, and ſo to the leaſt, denoting, comparing, and collecting as before. From theſe, and other ſuch trials, it will be found very evident, that to force the air or other fluid into a ſmaller hole, of an incongruous Solid, there is required a greater force, than there is requiſite for the protruſion of it into a bigger. Come we therefore to the explanation of the *Phænomena*, in the experiment of the riſing of water in a ſmaller Pipe; And from the application of what has been ſaid to the entring of the Air into the bigger hole of the Veſſel and into the ſmaller

hole

hole of the Pipe, we ſhall clearly find, that there is a greater preſſure of the air upon the water in the Veſſel or greater Pipe, than there is upon that in the Leſſer Pipe: For ſince the preſſure of the air every way is found to be as much as is able to preſs up and ſuſtain a Cylinder of Quickſilver of two foot and a half high, or thereabouts; And ſince of this preſſure ſo many more degrees are required to force the Air into a ſmaller than into a greater hole, that is full of a more congruous fluid. And laſtly, ſince thoſe degrees that are requiſite to preſs it in, are thereby taken off from the Air within, and the Air within left with ſo many degrees of preſſure leſs than the Air without; it will follow, that the Air in the leſs Tube or Pipe, will have leſs preſſure againſt the ſuperficies of the water therein, than the Air in the bigger: which was the minor Propoſition to be proved.

The Concluſion therefore will neceſſarily follow, *viz.*

That this unequal preſſure of the Air cauſed by its protruſion into unequal holes, is a cauſe ſufficient to produce this effect, without the help of any other concurrent,

concurrent, and therefore is the principal, (if not the only) cauſe of this *Phænomenon.*

This therefore being thus explained, there will be divers *Phænomena* explicable thereby, as, the Riſing of Liquors in a Filtre, the riſing of Spirit of Wine, Oyl, Melted Tallow, *&c.* in the Weake of a Lamp, (though made of ſmall Wire, Threeds of Asbeſtus, Strings of Glaſs, or the like) the Riſing of Liquors in a Spunge, piece of Bread, perhaps alſo the aſcending of the Sap in Trees and Plants, through their ſmall, and ſome of them imperceptible Pores, (of which perhaps I may ſay more on another occaſion) at leaſt the paſſing of it out of the earth into their roots. I know not alſo whether it will be requiſite to add what things occurr'd to my thoughts, when I had theſe *Phænomena* under conſideration; which I ſhall only propound as *Queries*, that may ſerve as hints to ſome further diſcovery, and not as Axioms.

In ſhort, they were theſe;

Firſt, Upon the conſideration of the congruity and incongruity of Bodies, as to touch, I found alſo the like congruity

gruity and incongruity (if I may ſo ſpeak) as to the Tranſcurſion of the Raies of Light: For in this regard, water (not now to mention other Liquors) ſeems nearer of affinity to glaſs than Air, and Air than Quickſilver: For an obliqne Ray out of Glaſs, will paſs into water with very little refraction from the perpendicular, but none out of Glaſs into Air, excepting a direct, will paſs without a very great refraction from the perpendicular, nay any obliqne Ray under 30 degrees, will not be admitted into the Air at all, but reflected. And Quickſilver will neither admit obliqne or direct, but reflect all; ſo that Quickſilver as to the tranſmitting of the Raies of Light, ſeems to be of a quite differing conſtitution, from that of Air, Water, Glaſs, &c. and to aſſimilate moſt thoſe opacous and ſtrong reflecting bodies of Metals: and as to the property of coheſion or congruity, it ſeems to keep the ſame order.

A Second thing (which was hinted to me, by the conſideration of the included fluid's globular form, cauſed by the protruſion of the ambient hetero-

geneous fluid) was whether the *Phænomena* of gravity might not by this means be explained, by ſuppoſing the Globe of Earth, Water and Air to be included with a fluid, heterogeneous to all and each of them, which is ſo ſubtil, as not only to be every where interſperſed through the Air, (or rather the air through it) but does pervade the bodies of Glaſs, and even the cloſeſt Metals, by which means it does endeavour to detrude all earthly bodies as far from it as it can; and partly thereby, and partly by other of its properties (of which I may ſome other time give a fuller account) move them towards the Center of the Earth. Now that there is ſome ſuch fluid, I could produce many experiments and Reaſons, that do ſeem to prove. But becauſe I ſee it would ask ſome time and room to ſet them down and explain them, and to conſider and anſwer all the Objections (many whereof I foreſee) that may be alledged againſt it; and becauſe I know a more likely hypotheſis for gravity, which I can make out by experiment; I ſhall at preſent proceed to other Queries, contenting my ſelf to have here only given a

hint

hint of what I may elſwhere determine.

A Third Query then was, whether the heterogeneity of the ambient fluid may not be accounted a ſecondary cauſe of the roundneſs or globular form of the greater bodies of the world, ſuch as are thoſe of the Sun, Stars and Planets, the ſubſtance of each of which ſeems altogether heterogeneous to the circum-ambient fluid æther?

A Fourth was, Whether the globular Form of the ſmaller parcels of matter here upon the Earth, as that of Fruits, Pebbles or Flints &c. (which ſeem to have been a Liquor at firſt) may not be caus'd by the heterogeneous ambient fluid. For thus we ſee that melted Glaſs will be naturally form'd into a round Figure, ſo likewiſe any ſmall Parcel of any fuſible body, if it be perfectly encloſed by the Air, will be driven into a globular Form, and when cold, will be found a ſolid Ball. This is plainly enough manifeſted to us by their way of making ſhot with the drops of Lead, or a ſhower of Rain congealed in its falling into Hailſtones, and if you gently let fall a drop of water upon ſmall ſand or duſt, you ſhall find as 'twere an artificial round

ſtone quickly generated. I cannot upon this occaſion omit the mentioning of the ſtrange kind of Grain which I have obſerved in a ſtone brought from *Kettering* in *Northamptonſhire*, and therefore called by Maſons *Kettering-Stone*, like to which are found alſo at *Tormarton*, neer to *Sudberry* in *Glocesterſhire*: For I found it to conſiſt of a great number of ſmall and almoſt globular parcels of matter, which to my naked eye look'd much like the Cob or Spawn of a Herring, though through a Microſcope it looked like a great Beach of round Pebble ſtone, ſuch as I have often ſeen by the Sea-ſhore, ſome of which I perceived to be hollow, much like the broken Shels of Granadoes. Which brings into my mind what I long ſince obſerv'd in the fiery Sparks that are ſtruck out of a flint, &c. For having a great deſire to ſee what was left behind, after the Spark was gone out, I purpoſely ſtruck fire over a very white piece of Paper, and obſerving diligently where ſome conſpicuous ſparks went out, I found a very little black ſpot no bigger than the point of a Pin, which through a Microſcope appeared to be a perfectly round

Ball

Ball, looking much like a polisht ball of Steel, insomuch that I was able to see the Image of the window reflected from it, making the like Observation in very many others, I found some to be hollow, and to look like the broken shels of Granadoes, much like that represented in the 4th. Figure. I cannot here stay to examine the particular Reasons of it, but shall only hint, that I imagine it to be some small parcel of the flint or steel (for I find it may be of either) which by the violence of the motion of the stroke (most of which seems to be impresst upon those small parcels) is made so glowing hot, that 'tis melted into a *Vitrum*, which by the ambient Air is driven into a round Globul.

A Fifth thing which I thought worth Examination was, Whether the motion of all kind of Springs, might not be reduc'd to the Principle whereby the included heterogeneous fluid seems to be moved: or to that whereby two solids, as Marbles, or the like, are thrust and kept together by the Ambient fluid.

A Sixth thing was, Whether the Rising and Ebullition of the water out

of Springs & Fountains (which lie much higher from the Center of the earth than the ſuperficies of the Sea, from whence it ſeems to be derived) may not be explicated by the Riſing of water in a ſmaller Pipe: For the Sea-water being as it were ſtrain'd through the Pores or Crevices of the earth, is as it were included in little Pipes, where the preſſure of the Air has not ſo great a power to reſiſt its Riſing: But examining this way, and finding in it ſeveral difficulties almoſt irremoveable, I thought upon a way that would much more naturally and conceiveably explain it, which was by this following Experiment: I took a Glaſs Tube of the form of that deſcribed in the 6th. Figure, and chuſing two heterogeneous fluids, ſuch as water and Oyl, I poured in as much water as fill'd up the Pipes as high as (A. B.) then putting in ſome Oyle into the Tube (A. C.) I depreſt the ſuperficies (A.) of the water to (E.) and B. I raiſed to G. which was not ſo high perpendicularly as the ſuperficies of the Oyle F. by the ſpace (F. I.) wherefore the proportion of the gravity of theſe two Liquors was as (G. H.) to (F. E.)

This

This Experiment I tried with ſeveral other Liquors, and particularly with freſh water and ſalt (which we made by diſſolving Salt in warm water) which two though they are nothing heterogeneous, yet before they would perfectly mix one with another, I made trial of the Experiment: Nay, letting the Tube wherein I tried the Experiment remain for many daies, I obſerved them not to mix, but the ſuperficies of the freſh was rather more than leſs elevated above that of the ſalt. Now the proportion of the gravity of Sea-water, to that of River-water, according to *Stevinus* and *Varenius*, (for I have not now the opportunity of making trial my ſelf) is as 46. to 45. that is, 46. Ounces of the ſalt-water will take up no more Room than 45 of the freſh. Or reciprocally 45 pints of ſalt-water weigh as much as 46 of freſh. Though I conceive the difference to be much more, for I found the proportion of Brine to freſh water to be near 13 to 12: Suppoſing therefore G. H. M. to repreſent the Sea, and F. I. the height of the Mountain above the Superficies of the Sea, F. M. a Cavern in the Earth, be-

ginning at the bottom of the Sea, and terminated at the top of the Mountain, I. M. the Sand at the bottom, through which the water is as it were strained, so as that the fresher parts are only permitted to transude, and the saline kept back; if therefore the proportion of G. M. to F. M. be as 45. to 46. then may the Cylinder of salt water G. M. make the Cylinder of fresh water to rise as high as E. and to run over at N. I cannot here stand to examine or confute their Opinion, who make the depth of the Sea, below its Superficies, to be no more perpendicularly measur'd than the height of the Mountains above it: 'Tis enough for me to say, there is no one of those that have vented it, have experimentally known the perpendicular of either; nor shall I here determine, whether there may not be many other causes of the separation of the fresh water from the salt, as perhaps some parts of the earth through which it is to pass, may contain a sale, that mixing and uniting with the Sea salt, may precipitate it; much after the same manner as the Alkalizate and Acid Salts mix and precipitate each other in the prepa-

ration

ration of *Tartarum Vitriolatum*. I know not alſo whether the exceeding cold (that muſt neceſſarily be) at the bottom of the water, may not help towards this ſeparation, for we find, that warm water is able to diſſolve and contain more ſalt, than the ſame cold; inſomuch that Brines ſtrongly impregnated by heat, if let cool, do ſuffer much of their ſalt to ſubſide and chryſtallize about the bottom and ſides. I know not alſo whether the exceeding preſſure of the parts of the water one againſt another, may not keep the Salt from deſcending to the very bottom, as finding little or no room to inſert it ſelf between thoſe parts, protruded ſo violently together, or elſe ſqueeze it upwards into the ſuperiour parts of the Sea, where it may more eaſily obtain room for it ſelf, amongſt the parts of the water, by reaſon that there is more heat and leſs preſſure. To this Opinion I was ſomwhat the more induced by the relations I have met with in ſeveral Geographical Writers, of drawing freſh water from the bottom of the Sea, which is ſalt above. I cannot now ſtand to examine, whether this natural perpetual motion may not

artificially

artificially be imitated? Nor can I ſtand to anſwer the Objections which may be made againſt this my Suppoſition: As,

Firſt, How it comes to paſs, that there are ſomtimes ſalt Springs much higher than the Superficies of the water? And,

Secondly, Why Springs do not run faſter and ſlower, according to the varying height made of the Cylinder of Sea-water, by the ebbing and flowing of the Sea?

As to the Firſt, In ſhort, I ſay, the freſh water may receive again a ſaline Tincture near the Superficies of the Earth, by paſſing through ſome ſalt Mines, or elſe many of the ſaline parts of the Sea may be kept back, though not all.

And as to the Second, The ſame Spring may be fed and ſupply'd by divers Caverns, coming from very far diſtant parts of the Sea, ſo as that it may in one place be high, in another low water; and ſo by that means the Spring may be equally ſupply'd at all times. Or elſe the Cavern may be ſo ſtraight and narrow, that the water not having

having ſo ready and free paſſage through it, cannot upon ſo ſhort and quick mutations of preſſure, be able to produce any ſenſible effect at ſuch a diſtance. Beſides, that to confirm this hypotheſis, there are many Examples found in Natural Hiſtorians, of Springs that do ebb and flow like the Sea: As particularly, thoſe recorded by the Learned *Camden*, and after him by *Speed*, to be found in this Iſland: One of which, they relate to be on the Top of a Mountain, by the ſmall Village *Kilken* in *Flintſhire*, *Maris æmulus qui ſtatis temporibus ſuas revomit & reſorbet Aquas*; which at certain times riſeth and falleth after the manner of Sea-Tides. A Second in *Caermardenſhire*, near *Caermarden*, at a place call'd *Cantred Bichan*; *Qui* (*ut ſcribit Giraldus*) *naturali die bis undis deficiens, & toties exuberans, marinas imitatur inſtabilitates.* That twice in four and twenty hours ebbing and flowing, reſembleth the unſtable Motions of the Sea. The *Phænomena* of which two may be eaſily made out, by ſuppoſing their Cavern by which they are fed, to ariſe from the bottom of the next Sea. A Third, is a Well

upon

upon the River *Ogmore*, in *Glamorgan-shire*, and near unto *Newton*, of which *Camden* relates himself to be certified, by a Letter from a Learned Friend of his that observed it, *Fons abest hinc*, &c. The Letter is a little too long to be inserted, but the substance is this, that this Well ebbs and flows quite contrarily to the flowing and ebbing of the Sea in those parts: for 'tis almost empty at Full Sea, but full at Low water. This may happen from the Channel by which it is supplied, which may come from the bottom of a Sea very remote from those parts, and where the Tides are much differing from those of the approximate shores. A Fourth lies in *Westmerland*, near the River *Leder*; *Qui instar Euripi sapius in die reciprocantibus undis fluit & refluit*, which ebbs and flows many times a day. This may proceed from its being supply'd from many Channels, coming from several parts of the Sea, lying sufficiently distant asunder to have the times of High-Water differing enough one from the other; so as that whensoever it shall be High Water over any of those places where these Channels begin, it shall likewise be so in the Well.

Well. But this is but a Supposition.

A Seventh thing was, Whether in general the Glutinousness of most bodies may not be partly attributed to this property? For supposing glutinous bodies to be such as will easily conform themselves to the superficies of homogeneal bodies, and being suffered for some time to rest in that Position, until they grow hard, the intercourse of the Air or other fluid body being hindred, the force requisite to disjoyn those two superficies must necessarily be such as is able to preponderate and prevail against the pressure of the Air upon a superficies equal to that of the body which is toucht by the glutinous substance; for these two touch so exactly, that 'tis impossible for the Air to get between, until they are somwhat disjoyn'd, by which means the pressure of the Air can only be against the two outward sides opposite to those which joyn them together: This may be confirmed by the Experiment of two flat Marbles, pieces of Glass, and the like smooth bodies; for if they be so exactly plain, that by rubbing them together, you can detrude the interjacent

cent Air, you shall find them stick so hard, that an ordinary strength can hardly separate them; especially if they be of any bigness.

* Of this much has bin said in the 31 & 32 Experiments of the above-mentioned Discourse of the *Air*, & is more copiously explained in a Treatise of the same Honourable *Author* now in the Presse.

This Property I say, may at least be the cause why some bodies adhere to Glass, and the like: For I am not ignorant, that as for Wood, and many other porous bodies, the glutinous substance may penetrate into their little cavities, and so hardning, become little Hooks or Buttons, that may contribute much to the former Cohesion.

An Eighth Query was, Whether the dissolution or mixing of several bodies, whether fluid or solid, with saline or other Liquors, might not partly be attributed to this Principle of the congruity of those bodies and their dissolvents? As of Salt in water, Metals in several Menstruums, Unctuous Gums in Oyles, the Mixing of Wine and water, *&c.* And whether precipitation be not partly made from the same Principle of Incongruity? I say partly, because there are in some dissolutions, some other Causes concurrent.

I shall lastly make a much more seemingly

ingly strange and unlikely Query; and that is, Whether this Principle well examined and explain'd, may not be found a co-efficient in the most considerable Operations of Nature? As in those of Heat and Light, and consequently, of Rarefaction and Condensation, Hardness or Solidity and Fluidness, Perspicuity and Opacousness, Refractions and Colours, &c. Nay, I know not whether there may be many things done in Nature, in which this may not (be said to) have a Finger? This I may possibly further enquire into and examine, if God grant me Life and Opportunity. In the mean time, I would not be thought guilty of that Errour, which the thrice Noble and Learned *Verulam* justly takes notice of, as such, and cals *Philosophiæ Genus Empiricum, quod in paucorum Experimentorum Angustiis & Obscuritate fundatum est.* For I neither conclude from one single Experiment, nor are the Experiments I make use of, all made upon one Subject: Nor wrest I any Experiment to make it *quadrare* with any preconceiv'd Notion. But on the contrary, I endeavour to be conversant in all kind of Experiments,

and

and all and every one of those Trials, I make the standards (as I may say) or Touchstones by which I try all my former Notions, whether they hold not in weight and measure and touch, &c. For as that Body is no other than a Counterfeit Gold, which wants any one of the Proprieties of Gold, (such as are the Malleableness, Weight, Colour, Fixtness in the Fire, Indissolubleness in *Aqua fortis*, and the like.) though it has all the other; so will all those notions be found to be false and deceitful, that will not undergo all the Trials and Tests made of them by Experiments. And therefore such as will not come up to the desired Apex of Perfection, I rather wholly reject and take a new, than by piecing and patching endeavour to retain the old, as knowing old things to be rather made worse by mending, than better. And this course I learn'd from Nature; whom we find neglectful of the old Body, and suffering its Decaies and Infirmities to remain without repair, and altogether solicitous and careful of perpetuating the Species by new Individuals. And 'tis certainly the most likely way to erect a

glorious

glorious and everlasting structure and Temple to Nature, such as she will be found (by any zealous Votary) to reside in; first to raze the old Pile built upon unstable Fancies and unsound opinions, and so begin a new upon a sure Foundation of Experiments. Thus *Medea* when she renewed old *Æson*, first searches Heaven and Earth, gathers and collects simples and Ingredients of all kinds, nor would these do any thing till well mixt, concocted and digested.

Omnia confudit, summaq; immiscuit ima.

Then we find her examine whether it will do what she expected.

Ecce, vetus calido versatus stipes aheno
Fit viridis primo, nec longo tempore frondes
Induit, & subito gravidis oneratur Olivis.
At quacunq; cavo spumas ejecit aheno
Ignis, & in terram gutta excidere calentes:
Vernat humus floresq; & mollia pabula surgunt.

And finding it to come up to what she desired, she then begins her great work.

Quæ simul ac vidit strictâ Medæa recludit
Ense senis jugulum: veteremq; exire cruorem
Passa, replet succis:

After which, what succeeded, but a miraculous Renovation?

——— Barba, comæq;
Canitie positâ, nigrum rapuere colorem
Pulsa fugit macies: Abeunt pallorq; situsq;
Adjectoq; cavæ supplentur corpore rugæ:
Membraq; luxuriant ———

The Application of it is obvious, and therefore (to digress no further from the consideration of the *Phænomena*, more immediatly explicable by this Experiment) we shall proceed to shew, That,

As to the rising of water in a Filtre, the reason of it will be manifest to him that does take notice that a Filtre is constituted of a great number of small long solid bodies, which lie so close together, that the Air in its getting in between them, doth lose of its pressure that it has against the fluid without them, by

which

which means the water or liquor not finding ſo ſtrong a reſiſtance between them as is able to counter ballance the preſſure on its ſuperficies without, is raiſed upward, till it meet with a preſſure of the Air which is able to hinder it. And as to the Riſing of Oyl, melted Tallow, Spirit of Wine, &c. in the Weeck of a Candle or Lamp, it is evident, that it differs in nothing from the former, ſave only in this, that in a Filtre the Liquor deſcends and runs away by another part, and in the Weeck the Liquor is diſperſed and carried away by the Flame (which what it is, and how it conſumes bodies, I ſhall on ſome other occaſion by many luciferous Experiments manifeſtly prove) ſomething there is aſcribable to the heat, for that it may rariſie the more volatil and ſpirituous parts of thoſe combuſtible Liquors, and ſo being made lighter than the Air, it may be protruded upwards by that more ponderous fluid body in the Form of Vapours. But this can be aſcribed to the aſcenſion of but a very little, and moſt likely of that only which aſcends without the Weeck, as for the Riſing of it in a Spunge, Bread,

Cotton, &c. above the superficies of the subjacent Liquor; what has been said about the Fibres (if considered) will easily suggest a reason, considering that all these bodies are bound with small holes or pores.

From this same Principle also (*viz.*) the unequal pressure of the Air against the unequal superficies of the water) proceeds the cause of the accession or incursion of any floating body against the sides of the containing Vessel, or the appropinquation of two floating bodies, as Bubbles, Corks, Sticks, Straws, &c. one towards another. As for instance, Take a Glass-jar, such as (A. B.) in the 7th. Figure, and filling it pretty near the top with water, throw into it a small round piece of Cork, as (C.) and plunge it all over in water, that it be wet, so as that the water may rise up by the sides of it, then placing it any where upon the superficies, about an inch, or one Inch and a quarter from any side, and you shall perceive it by degrees to make perpendicularly toward the nearest part of the side, and the nearer it approaches it, the faster to be mov'd, the reason of which *Phænomenon* will be found

found no other than this, that the Air has a greater pressure against the middle of the superficies, than it has against those parts that approach nearer, and are contiguous to the sides. Now that the pressure is not so much, may (as I shewed before in the explication of the 3d Figure) be evinced from the rising of the water near the sides, higher than that in the middle: Hence the Ball having a stronger pressure against that side of it which respects the middle of the superficies, than against that which respects the approximate side, must necessarily move towards that part from whence it finds least resistance, and so be accelerated, as the resistance decreases. Hence the more the water is raised under that part of its way it is passing above the middle, the faster it is moved: And therefore you will find it to move faster in E. than in D. and in D. than in C. Neither could I find the floating substance to be moved at all, until it were placed upon some part of the Superficies that was sensibly elevated above the height of the middle part. Now that this may be the true cause, you may try with a blown Bladder, and an exact-

ly

ly round Ball upon a very smooth Table. For if the Ball be plac'd under a part of the Bladder wch is upon one side of the middle of its pressure, & you press strongly against the Bladder, you shall find the Ball mov'd from the middle towards the sides. Having therefore shewn the reason of the motion of any float towards the sides, the reason of the incursion of any two floating bodies will easily appear: For the rising of the water against the sides of either of them, is an Argument sufficient, to shew the pressure of the Air to be there less, then it is further from it, where it is not so much elevated; and therefore the reason of the motion of the other toward it, will be the same as towards the side of the Glass; only here from the same reason, they are mutually mov'd toward each other, whereas the side of the Glass in the former remains fixt. If also you gently fill the Jar so full with water, that the water is protuberant above the sides, of the same piece of Cork that before did hasten towards the sides, does now fly from it as fast towards the middle of the Superficies; the reason of which will be found no other then this, that the pres-

sure

ſure of the Air is ſtronger againſt the ſides of the ſuperficies G. and H. then againſt the middle I. which may be argu'd from its being much lower then the middle; and therefore the conſecution will be the ſame as in the former. It is very odd to one that conſiders not the reaſon of it, to ſee two bodies of wood to approach each other, as though they were indued with ſome magnetical vigour; which brings into my mind what I formerly tried with a piece of Cork or ſuch like body, which I ſo ordered, that by putting a little ſtick into the ſame water, one part of the ſaid Cork would approach and make toward the ſtick, whereas another would diſcede and fly away, nay it would have a kind of verticity, ſo as that if the æquator (as I may ſo ſpeak) of the Cork were placed towards the ſtick, if let alone, it would inſtantly turn its appropriate pole toward it, and then run a tilt at it, and this was only by taking a dry Cork, and wetting one ſide of it with one ſmall ſtroak; for by this means gently putting it upon the water, it would depreſs the ſuperficies on every ſide of it that was dry, and therefore the greateſt preſ-

ſure

sure of the Air being near those sides caus'd it either to chase away, or else to fly off from any other flowing body, whereas that side only against which the Water ascended, was thereby able to attract. I cannot here stay to explain the Reasons of magnetical and electrical attraction, nor the Reasons of gravity or magnetical direction and variation, they being little or nothing at all to my present Subject, and besides, will afford matter enough to fill another sheet when I have leisure.

It remains only, that I should determine how high the water or other Liquor may by this means be raised in a smaller Pipe above the superficies of that without it: But to determine this, will be exceeding difficult, unless I could certainly know how much of the Air's pressure is taken off by the smalness of such and such a Pipe, and whether it may be wholly taken off, that is, whether there can be a hole or pore so small, into which Air could not at all enter, though water might with its whole force, for were there such, 'tis manifest, that the water might rise in it to some five or six and thirty English Foot high. I know not whether there may not be such natural Pipes in the bodies of small Trees, which we usually call their Pores, But I have already pretergressed the bounds of a Sheet, which I at first prescribed my self for the explication of this *Phænomenon*, and therefore I shall at present make

AN END.